

A direct quantitative measure of surface mobility in a glassy polymer

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Thin polymer films are widely used in applications and have striking dynamical properties that differ from their bulk counterparts. With the simple geometry of a stepped polymer film on a substrate, we probe mobility above and below the glass transition temperature T_g . Above T_g the entire film flows, while below T_g only the near surface region responds to the excess interfacial energy. An analytical thin film model for flow limited to the free surface region is developed and shows excellent agreement with sub T_g data. The system transitions from whole film flow to surface localized flow over a narrow temperature region near the bulk T_g . The experiments and model provide a measure of surface mobility in a sample geometry where confinement and substrate effects are negligible. This work has been done in collaboration with Y. Chai, T. Salez, J. D. McGraw, M. Benzaquen, K. Dalnoki-Veress and J. A. Forrest [1].

[1] Y. Chai, T. Salez, J. D. McGraw, M. Benzaquen, K. Dalnoki-Veress, E. Raphaël, J. A. Forrest, *A direct quantitative measure of surface mobility in a glassy polymer*, *Science* **343** (2014) 994.